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San Francisco, California

1943

THE PAN-PACIFIC ENTOMOLOGIST

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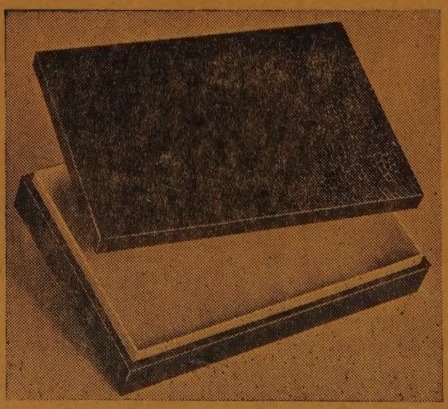

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FIG. 1

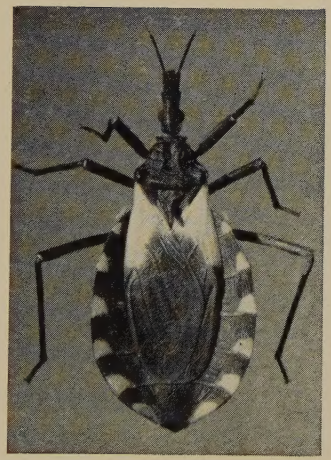

FIG. 2

FIG. 3

The Pan-Pacific Entomologist

VOL. XIX, No. 3 JULY, 1943

TRIATOMA PHYLLOSOMA USINGERI, A NEW SUBSPECIES OF TRIATOMA FROM MEXICO*

BY LUIS MAZZOTTI

Laboratory of Helminthology
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In an earlier work (Mazzotti and Osorio, 1942), based principally upon several crossing experiments, we proposed that the Mexican triatomas, *Triatoma pallidipennis* (Stål),), *Triatoma picturata* Usinger, and *Triatoma mazzottii* Usinger, be considered as subspecies of *Triatoma phyllosoma* (Burmeister). The new combinations would be as follows: *Triatoma phyllosoma pallidipennis, Triatoma phyllosoma picturata,* and *Triatoma phyllosoma mazzottii.*

In studying specimens of triatomas collected in Autlán, Jalisco, the place where we (Mazzotti, 1940) had indicated the presence of two different species, we found that the specimens which had been identified as *picturata* are similar structurally to those identified as *pallidipennis.*

According to the key and distribution given by Usinger (1941) the specimens from Jalisco and Colima that have the greater part of the corium whitish correspond to the species *pallidipennis* and those that have the greater part of the corium black, to the species *picturata.*

From the examination of numerous specimens and from the results of new crossing experiments it appears that *picturata* of Autlán, Jalisco (Figure 1) and *pallidipennis* of Autlán, Jalisco (Figure 2) are two variations of the new subspecies described below.

Triatoma phyllosoma usingeri, new subspecies

A large, predominantly black subspecies with scant pilosity on the pronotum.

Length of head, excluding neck region, more than double the greatest width at level of eyes. Anteocular portion four times as long as postocular portion. Tylus longer than half the anteocular

* Translated by Dr. Iver Nelson of the University of California, Davis, California.

length, fusiform, and enlarged on its posterior third. Eyes, seen from above, a little more than half as wide as interocular space, 13::22. Ocelli prominent, each ocellus situated at the anterior end of an oblique elevation. Antennae inserted at middle of anteocular region; the first segment slightly surpassing apex of head; proportion of segments 15:45:40:35. Rostrum with short, fine hairs; curved inward at its basal and middle segments and straight at apical segment; proportion of segments 20:33:12.

Pronotum wider than long, 65::50; its length slightly less than that of head, excluding neck region. Antero-lateral tubercles conical, apically obtuse, projecting outward and forward. Anterior inner tubercles smaller, located near mid-line and near anterior margin. Posterior external tubercles near lateral margin small. Posterior lobe of pronotum with obsolescent wrinkles, inner and outer carinae reduced. Scutellum scarcely broader than long, its posterior prolongation cylindrical-conical in form and rounded at apex.

Hemelytra long, reaching anterior end of last abdominal segment. Connexivum broad and semitransparent at the markings. Under surface covered with short hairs, longer toward front of thorax.

Color black, except on the following regions: neck which has an ochraceous transverse margin; corium which is entirely whitish except for black apical portion and black membranous half of clavus; connexivum except for pale ochraceous markings which correspond in size and position on dorsal and ventral sides.

Size: male, length 31 mm., maximum width (pronotum) 6.5 mm., maximum width (abdomen) 14 mm.; female, length 32 mm., maximum width (pronotum) 7 mm., maximum width (abdomen) 15 mm.

Holotype, male, allotype, female, and six paratypes, in the collection of the Institute of Health and Tropical Diseases, collected by the author in Autlán, Jalisco, with the kind collaboration of Dr. L. E. Villaseñor.

Additional specimens are at hand from Purificación, Jalisco, and from Colima, Col.

Two paratypes are deposited in the U. S. National Museum, two in the Instituto Oswaldo Cruz, and two in the California Academy of Sciences.

In several of the paratypes the corium is mostly black with a whitish area basally and a smaller white area subapically, this last being absent in some specimens. A regular proportion of the specimens have ochraceous on the postero-lateral angles of the pronotum.

This subspecies is dedicated to Dr. R. L. Usinger in recognition of his valuable studies on American triatomas.

Observations. This subspecies is differentiated from *Triatoma phyllosoma pallidipennis* in that the latter has abundant long hairs on the pronotum; *usingeri* has scant hairs on the pronotum and varies in color, the pronotum being entirely black or with ochraceous markings on the posterior angles and the corium also varying in distribution and size of markings. *Pallidipennis* does not exhibit these variations in coloration.

It will be recalled that Stål (1872), in describing *pallidipennis*, did not give the exact locality of origin of the specimen or specimens on which he based his description, merely stating that the species came from Mexico. Nevertheless, the fact that he mentioned pilosity and black color as principal characters seems to justify our conclusions that specimens from the State of Guerrero and adjacent regions be considered as typical.

Structurally *usingeri* is similar to *picturata* but it is differentiated biologically as indicated by the experiments presented below. Likewise the variations in coloration are different in these subspecies and the pale color of *usingeri* is white slightly tinged with yellow whereas the pale color of *picturata* is distinctly orange. The subapical pale spots of the corium of the dark form of *usingeri* are smaller than the corresponding spots in *picturata*.

Crossing experiments. The crossing experiments were conducted using the same methods explained in our previous article.

According to the former experiments (Mazzotti and Osorio, 1942) the crossing of *pallidipennis* (collected in Guerrero and adjacent states) and *picturata* (from Nayarit) produced, among other examples, some specimens which have the appearance of both subspecies (Figure 3) and which should be designated as *T. phyllosoma pallidipennis* x *T. phyllosoma picturata* or the reverse when the male of the pair of parents is *picturata*.

These mixed specimens also have been obtained in crossing experiments with specimens from Autlán. To facilitate the presentation we shall designate these mixed examples as pxp. In table I "*picturata*" and "*pallidipennis*" from Autlán are the forms of *usingeri* which resemble *picturata* and *pallidipennis* respectively.

TABLE I

Crossing Experiments between subspecies of *Triatoma phyllosoma.*

NUMBER	SUBSPECIES CROSSED	RESULTS
Experiment 1	♂ *pallidipennis* from Apatzingán, Gro. ♀ *"picturata"* from Autlán, Jal.	Among other specimens are several pxp.
Experiment 2	♂ *"pallidipenns"* from Autlán, Jal. ♀ *picturata* from Trapiche, Nay.	Among other specimens are several pxp.
Experiment 3	♂ *"pallidipennis"* from Autlán, Jal. ♀ *"picturata"* from Autlán, Jal.	There are no pxp specimens among the descendants.
Experiment 4	♂ *picturata* from Trapiche, Nay. ♀ *"picturata"* from Autlán, Jal.	Among other specimens are several pxp.

Results. The result of experiment 1 suggests that the *"picturata"* specimens from Autlán, Jalisco, behave like *picturata* from Trapiche, Nay., since in being crossed with *pallidipennis* of Guerrero, they produced pxp individuals. Experiment 2, in its turn, suggests that *"pallidipennis"* of Autlán behaves like *pallidipennis* from the state of Guerrero, since on being crossed with *picturata* of Nayarit, it produces pxp specimens.

From these two separate experiments it might be concluded that the two subspecies, *pallidipennis* and *picturata*, occur side by side in Autlán, Jalisco.

Nevertheless, experiment No. 3 modifies the above conclusion because the crossing of *"pallidipennis"* and *picturata"* of Autlán does not produce pxp specimens and furthermore such specimens have not been found in repeated collections from Autlán, notwithstanding the fact that these two supposed species occur together in nature.

Finally, experiment No. 4 shows that *"picturata"* from Autlán is different biologically from *picturata* of Nayarit because crosses between these two result in pxp specimens similar to those obtained in crosses between *pallidipennis* of Guerrero and *picturata* of Nayarit.

Although we have made no crossing experiments between *pallidipennis* of Guerrero and *"pallidipennis"* of Autlán, it is pos-

sible to differentiate one from other by some structural details and by the variations in coloration exhibited by "*pallidipennis*" of Autlán but not seen in *pallidipennis* of Guerrero.

In resumé the subspecies *usingeri* (= "*pallidipennis*" and "*picturata*" of Autlán) exhibits two extreme variations which mix with *pallidipennis* and *picturata.*" This subspecies is differentiated from the true *pallidipennis* by structural characters and is separated from the true *picturata* by color and biological characters, the crosses with this last subspecies producing pxp specimens which are not found in the offspring of crosses between the two variations of *usingeri.* Crosses between the two variations of *usingeri* result in offspring which look like the parents.

References

Mazzotti, L. 1940. Triatomideos de México y su infección natural por *Trypanosoma cruzi.* Medicina Rev. Mex. XX, No. 358:95 110.

Mazzotti, L. and M. T. Osorio. 1942. Cruzamientos experimentales entre varias especies de triatomas. Medicina Rev. Mex. XXII, No. 412:215-220.

Stål, C. 1872. Enumeratio Hemipterorum. 2 Kongl. Svenska Vet.-Akad. Handl. 10, No. 4:110-111.

Usinger, R. L. 1941. Notes and descriptions of Neotropical Triatominae. Pan-Pac. Ent., 17:49-58.

Habits of Amblycheila cylindriformis Say

A colony of these was located near the Denver Municipal Airport, Colorado. The species hides during the day in yucca clumps, the greatest emergence being about the time of the first real dark. By circling the clumps with a flashlight they were taken in considerable numbers. A prairie dog colony is found nearby, but in this instance at least, specimens were rarely found around dog holes, the yucca being much the preferred habitat. While *cylindriformis* is carnivorous it may also consume some vegetable matter. Individuals were commonest when the yucca blooms are falling, and were frequently discovered carefully shredding the dried petals. It appeared they were consuming a portion of this material, although this could not be exactly determined since the flashlight usually interrupted their activity. Incidentally, the shredding process is noisy and specimens were often located by sound at quite a distance.—Robert W. L. Potts.

NEW AND ADDITIONAL LOWER CALIFORNIA MOSQUITO RECORDS

(Diptera, Culicidae)

BY EDWARD S. ROSS

California Academy of Sciences

The following additional records of Lower California mosquitoes are based on material collected by G. E. Bohart and the writer during the 1941 California Academy of Sciences Expedition to Lower California. The three new records: *Aedes varipalpus, Psorophora discolor*, and *Psorophora signipennis*, bring the number of species known from the peninsula to twelve.[1]

(1) *Anopheles* (*Anopheles*) *p. pseudopunctipennis* Theobald. Agua Caliente (Cape Region), Oct. 18, 1941, female, at light.

(2) *Aëdes* (*Ochlerotatus*) *taeniorynchus* (Wiedemann). Coyote Cove, Concepcion Bay, October 1, 1941, one female at light.

(3) *Aëdes* (*Finlaya*) *varipalpus* (Coquillett). La Laguna, Sierra Laguna (Cape Region), October 14, 1941, females, biting.

This species was collected in a pine-oak forest at 6,200 feet elevation, a locality characterized by its Upper Sonoran biota isolated by several hundred miles of desert from comparable environments in the San Pedro Martir Mountains of the north.

(4) *Aëdes* (*Kompia*) *purpureipes* Aitken. Three miles south of La Paz, October 7, 1941, two females, at light.

(5) *Psorophora* (*Grabhamia*) *discolor* (Coquillett). Canipole, Sierra Giganta, October 2, 1941, three males at light.

(6) *Psorophora* (*Grabhamia*) *signipennis* (Coquillett). Canipole, October 2, 1941, a pair, at light; 15 miles south of San Domingo, Magdalena Plain, October 4, 1941, one female, at light; 3 miles S. of La Paz, October 7, 1941, female, at light.

The genus *Psorophora* is here recorded from the peninsula for the first time. Both species were collected in localities which had experienced recent rains. Species of the genus appear to be rarer and seldom collected in the southwestern desert regions because their normal breeding places, temporary ground puddles, often dry up too quickly following the sporadic rains to permit complete development.

[1] Aitken, T. H. G., 1942. Contributions toward a knowledge of the insect fauna of Lower California, No. 6, Diptera: Culicidae. Proc. Calif. Acad. Sci. (4) 24:161-170.

CULEX (*CULEX*) *THRIAMBUS* DYAR A NEW MOSQUITO RECORD FOR CALIFORNIA

(Diptera, Culicidae)

BY PEDRO GALINDO AND THOMAS F. KELLEY
University of California, Berkeley

Culex thriambus was described by Dyar in 1921 from adults and larvae collected at Kerrville, Texas. A year later, however, he stated: "The species (*thriambus*) is close to *stigmatosoma* and may be an eastern race of it." Finally in view of the similarity of the male terminalia of the two forms, *thriambus* was placed by its describer (1928) as a synonym of *Culex stigmatosoma* Dyar, but in a discussion of the latter species he added: "The Texas form *thriambus* has the hairs single on the air-tube of the larva, and is presumably entitled to subspecific rank."

Aitken (1940) reported several records of *Culex restuans* Theobald (as *territans* Walker) from California, but stated that females and larvae from this state differ in several respects from typical eastern *restuans*. On the other hand, males, females and larval skins collected by one of us (P.G.) in southern California agree well with descriptions of *C. restuans*, except for the presence of very narrow tarsal rings, which, according to Dr. Alan Stone (*in litt.*), are also present in a good number of eastern specimens of this species. Suspecting that Aitken (loc. cit.) had a mixture of two species, the authors reexamined his material and found only two females of *C. restuans* (Riverside, Calif., W. C. Reeves coll.) the rest being all *C. thriambus* Dyar, a mosquito previously unknown outside of Texas.

CULEX (CULEX) THRIAMBUS DYAR

Culex (*Culex*) *thriambus* Dyar, 1921, Ins. Ins. Mens., 9:33. Dyar, 1922, Proc. U. S. Nat. Mus., 62:22.

Culex (*Culex*) *stigmatosoma* var. *thriambus*, Edwards, 1932, Gen. Insect. Fasc. 194:206.

Culex (*Culex*) *stigmatosoma*, Dyar, 1928 (partim), Mosq. of the Amer., p. 368. Aitken, 1942 (partim), Proc. Calif. Acad. Sci., 24:169.

Culex stigmatosoma, Matheson, 1929 (partim), Handbook Mosq. No. Amer., p. 176.

Culex territans, Aitken, 1940 (nec. Walker), Proc. Ent. Soc. Wash., 42:146.

Notes on California Material. Female. As described by Dyar. The white patch on the underside of the proboscis is seen to extend around the sides in some specimens, but a complete ring is never formed. The extent and color of the pale rings on the hind tarsi vary; specimens from Riverside and Orange Counties have very narrow and brownish rings similar to those present in *C. restuans*, while specimens from Kern County show rather broad whitish rings and the fifth tarsal joint is occasionally entirely white as in *C. tarsalis* Coquillett. The markings on the venter are as described by Dyar for Texas specimens, and appear to be rather constant.

Male terminalia. As stated by Dyar (*loc. cit.*) the male terminalia of *thriambus* is very similar to that of *stigmatosoma;* there are, however, some constant differences which justify the separation of these two mosquitoes as distinct species. The subapical lobe of the basistyle is rounded in *stigmatosoma* and there is a long seta between the three rods and the leaf-like appendage; in *thriambus*, on the other hand, the subapical lobe is conically produced, and the seta between the three rods and the leaf-like appendage is absent. Dr. Alan Stone, who has examined Dyar's types of *C. thriambus* and other specimens of this species collected by Lt. E. S. Ross in Texas, informs us that male specimens in this material also lack the long seta between the rods and the leaf.

Larva. The larva of *C. thriambus* undoubtedly offers the best characters for the separation of the species. The air-tube is long; in 38 specimens examined the average siphonal index was 6.2; in the same number of *stigmatosoma* larvae measured the average siphonal index was only 5.0. The tufts on the air-tube are reduced to single hairs in *thriambus*, although some specimens collected in the Kern River Canyon show one and, rarely two, 2-haired tufts; in *stigmatosoma* the tufts on the tube are always multiple. The lateral abdominal hairs of segments III to VI also differ in these two species, being triple in *stigmatosoma* and double in *thriambus*.

Dr. Alan Stone kindly compared some of our larvae with Ross' material from Texas and found them identical.

Discussion of the Species. *Culex thriambus* Dyar has often been confused in California with *Culex restuans* Theobald, due to the reduction of the siphonal tufts of the larva to single hairs,

and to the unbanded proboscis of the female. The species is, however, a closer relative of *C. stigmatosoma* Dyar as evidenced by male terminalia characters. Dyar's opinion that *thriambus* represents an eastern race of *stigmatosoma* is no longer acceptable, since both forms occur in California where they may be separated with certainty on larval, adult, and male terminalia characters. In view of these facts the writers feel justified in elevating *thriambus* to specific rank again.

Following are the known records of *C. thriambus* in California: Marysville, Butte County, (U. S. Pub. Health Service), October, 1942; San Luis Obispo, San Luis Obispo County, (Aitken, Reeves, Dommes), July 31, 1940; Nipannawasee, Madera County, (T. H. G. Aitken), (No date); Kaweah River, Tulare County, (T. H. G. Aitken), May 11, 1939; Bakersfield, Kern County, (F. L. Hayes), February 7, 1941; Kern River Canyon, Kern County, (Galindo, Kelley, Aarons), August 1, 1942; San Juan River, Orange County, (P. Galindo), September 2, 1942; Santa Rosa Summit (elev. 5,000 ft.), Riverside County, (P. Galindo), September 4, 1942.

Key to California Species of Culex with Ringed Tarsi

Females

1. Proboscis ringed with white, tarsal rings broad.....2
   Proboscis with a white patch underneath, not completely ringed; tarsal rings usually narrow.....3
2. With a white line on outside of femora and tibiae; a V-shaped dark marking on venter of each abdominal segment.....*tarsalis*
   Without white line on outside of femora and tibiae; an oval dark spot on venter of each abdominal segment....*stigmatosoma*
3. Tarsal rings brownish and very narrow, venter of abdominal segments II to VI white basally, black apically.....*restuans*
   Tarsal rings usually white, variable in size; venter of abdominal segments II to VI with triangular dark markings.....*thriambus*

Larvae

1. Air-tube with several single hairs, and at most a single pair of 3-haired tufts.....2
   Air-tube with several pairs of multiple hair-tufts.....3
2. Antennae evenly tapered, antennal tufts at or near the middle of antennae; lateral abdominal hairs of segments IV and V single; subdorsal hairs of these segments also single....*restuans*
   Antennae not evenly tapered. antennal tufts distinctly beyond the middle of antennae; lateral abdominal hairs of segments IV and V double; subdorsal hairs of these segments 3- or 4-branched.....*thriambus*

3. Air-tube evenly tapered; all tufts of tube in a line, basal tuft beyond the pecten.....*tarsalis*
Air-tube not evenly tapered; penultimate tuft moved laterad out of line, basal tuft within the pecten.....*stigmatosoma*

Male Terminalia

1. Leaf of subapical lobe of basistyle modified, club-like; outer spines of paraprocts blunt and broad.....*tarsalis*
Leaf of subapical lobe of basistyle normal; outer spines of paraprocts pointed 2
2. Subapical lobe of basistyle with three rods, a leaf and a seta.....*thriambus*
Subapical lobe of basistyle with three rods, a long seta, a leaf and a seta.....3
3. Lobes of the ninth tergite well developed, mound-like. Lateral plate of the phallosome with a curved, spine-like inner arm and a short and blunt outer arm; some small denticles between the two processes.....*restuans*
Lobes of the ninth tergite rudimentary, represented by rows of long hairs; lateral plate of the phallosome with an erect and pointed inner arm with a slight knob at about the middle; outer arm rounded at tip, with serrated inner border, four hooks on the dorsal aspect and a long, club-like arm from the base. .....*stigmatosoma*

References

Aitken, T. H. G. 1940. On *Aedes nigromaculis* (Ludlow), *Aedes increpitus* Dyar and *Culex territans* Walker from California. Proc. Ent. Soc. Wash., 42:146.

Aitken, T. H. G. 1942. Contributions toward a knowledge of the insect fauna of Lower California. Part VI. Diptera, Culicidae. Proc. Calif. Acad. Sci., 24:168.

Dyar, H. G. 1921. Ring-legged *Culex* in Texas. Ins. Ins. Mens., 9:32-34.

Dyar, H. G. 1922. The Mosquitoes of the United States. U. S. Nat. Mus. Proc., 62:22-23.

Dyar, H. G. 1928. The Mosquitoes of the Americas. Carnegie Inst. Wash. Pub. 387 pp. 368-369.

Edwards, F. W. 1932. Diptera, Fam. Culicidae. Wystman's Genera Insectorum Fasc. 194 p. 206.

Freeborn, S. B. 1926. The Mosquitoes of California. Univ. of Calif. Pub., Tech. Bul., 3:438-442.

Matheson, R. 1929. Handbook of the Mosquitoes of North America. Charles C. Thomas, Publisher, p. 176.

THE CALIFORNIA-LAUREL BORER, *ROSALIA FUNEBRIS* MOTS.

(Coleoptera: Cerambycidae)

BY E. O. ESSIG

University of California, Berkeley

A few days ago I received about 150 specimens of this rather rare and beautiful beetle from F. H. Wymore who collected them in and about a commercial paint shop at Ukiah, California, during the summer of 1939. This is no doubt the most remarkable feat in the collection of this beetle ever noted and the circumstances involved are worthy of recording. For this purpose Mr. Wymore has kindly furnished the following information which I am pleased to quote with slight changes.

"I am sorry I have no definite data at hand relative to just when the beetles were collected. However, as near as I can recollect they were taken during a hot spell the latter part of July and the first part of August, 1939. This idea correlates with temperature records for the period of July 20 to August 6 inclusive. During the six days from July 20-25 inclusive the temperature averaged 104.83° F. with a range of 101° F. to 108° F. Then again from July 31 to August 6 (7 days) the average temperature was 101.57° F. with a range of 100° F. to 106° F. The five days between the hotter periods had an average of 94.4° F. with a range of 92° F. to 97° F. The minimum temperature during this period of 18 days averaged 53.05° F. with a range of 48° F. to 58° F.

"The principal flight of the beetles, of course, was in the heat of the day with a few active about the lights during the warmer evenings. In regard to the beetles showing preferences to materials in the paint shop there was a decided concentration of them in the corner of the shop where the paint vapors were most noticeable and the odor of amylacetate was strongest. In this environment the beetles scampered about in a rather excited manner and copulation was quite common. Once the beetles moved 25-50 feet beyond the area of concentrated paint vapors (which were very strong during this hot period) they became quiet and remained in a given location for periods of a few minutes to one or two hours depending upon the temperature and concentration of the light in the spot in which they came to rest. In some instances the beetles missed the paint shop

entirely, as they flew in, and alighted on buildings across the street and even halfway down the block.

"As to where these beetles emerged from, your guess is as good as mine. I thought at first they might be coming from a stump pile, consisting of several cords of stumps of various kinds of trees for fireplace use directly across the street from the paint shop. I made several observations about the stumps at various times of the day but was never able to find a single beetle in this environment.

"I had never before seen so many of these more or less rare beetles in all my entomological experiences and have observed only an occasional beetle in this locality since that year." (Ukiah, California, March 10, 1943.)

Ukiah is located in the Russian River Valley in the midst of the Coast Range Mountains. In this region there are dense and extensive growths of all the known host plants of this beetle including the California laurel, *Umbellularia californica* Nutt., Oregon ash, *Fraxinus oregona* Nutt., coast live oak, *Quercus agrifolia* Nee., California black oak, *Quercus kelloggii* Newb., the arroyo willow, *Salix lasiolepis* Benth., and the rarer lowland fir, *Abies grandis* Lindl.

This beetle has always been considered a prize by amateur and experienced collectors alike, and large series are rare in collections. I well remember my first specimen—a large female resting with legs and antennae extended on the green moss-covered trunk of a large California laurel tree at Camp Grant near Dyerville, Humboldt County, California, in 1907. Since then I have taken only one other living specimen.

Hibernation of Scaphinotus coloradensis Van Dyke

I have several times discovered this species hibernating in moderately damp regions along stream beds near the eastern foothills of the Colorado Rockies. One February, along the Platte River near Littleton, nine specimens were found in two rotten cottonwood logs. These had deteriorated to the soft stage, and in one or two cases the cychrids had worked themselves some six or eight inches into the punky material. Only one or two specimens were ever located during their more active summer period.—Robert W. L. Potts.

OLD WORLD SEPSIDAE IN NORTH AMERICA, WITH A KEY TO THE AMERICAN GENERA

(Diptera)

BY GEORGE STEYSKAL
Detroit, Michigan

Sepsis simplex Goetghebuer and Bastin

Sepsis simplex Goetghebuer and Bastin, 1925, Bull. et Ann. Soc. ent. Belg., 65:128, 132, pl. 1, f. 7.
S. simplex Frey, 1925, Notulae Ent., 5:71-75, f. 9.

A male specimen captured on Isle Royale, Michigan, August 3-7, 1936, by Curtis W. Sabrosky, was found to agree well with

Fig. 1. *Decachaetophora aeneipes* De Meijere, left profile of hypopygium and anterior view of right fore femur and tibia of male.

the original description of *S. simplex* and with Frey's figure of the male hypopygium. The species was described from Belgium and was stated by Frey to occur throughout Finland.

Decachaetophora aeneipes De Meijere

Sepsis aeneipes De Meijere, 1913, Ann. Mus. Nat. Hung., 11:119.
Decachaetophora aeneipes Duda, 1925, Ann. Naturhist. Mus. Wien, 39:27, 40 (Decachaetophora keyed and described); 1926, 1. c., 40:45, pl. 5, f. 54 (species described and figured).

Two male Sepsidae of a species found abundant on Iris plants

in a garden in the vicinity of White Swan, Washington (southeast of Yakima), on October 8, 1941, were kindly submitted by D. Elmo Hardy to the writer for determination. The specimens, in good condition, agree very well with De Meijere's and Duda's descriptions. Duda's figure of the fore leg of the male agrees well with our specimens, but inasmuch as no figure of the male hypopygium has been published figures of both a fore leg and the hypopygium of one of our male specimens is here given to facilitate recognition of the species and a check of its identity with Oriental material. Duda states that the scutellum is twice as long as broad, but this must be erroneous, the reverse being intended. The species has been recorded from Formosa, Japan and northern India.

Enicita annulipes Meigen

Sepsis annulipes Meigen, 1826, Syst. Beschr., 5:292.
Enicita annulipes Johnson, 1925, Occas. Pap. Boston Soc. Nat. Hist., 7:266.
E. annulipes Duda, 1925, Ann. Naturhist. Mus. Wien, 39:70, 142, pl. 1, ff. 3, 4b.
E. elegantipes Ouellet, 1940, Le Naturaliste Canadien, 67:225-228, f. 1 (*new synonym*).

Comparison of paratype material of *E. elegantipes* kindly furnished by Prof. Ouellet with the detailed description and figures of Duda leaves no doubt concerning the synonymy with this European species. Johnson has recorded *E. annulipes* from Fort Kent, Maine.

For the convenience of students who may have difficulty in gaining access to the literature of the Sepsidae the following key to the American genera is given. The rather narrow generic limits of Duda are largely followed and some of the genera included may prove untenable. *Palaeosepsis* has been rejected by Malloch and Curran, but the distinction has proven useful for the separation of neotropical material.

Key to the American Genera of Sepsidae

1. First and second basal cells united.....*Saltella* R.-D. (*Pandora* Hal.)
   [One species, *S. scutellaris* Fallen, in North America.]
   First and second basal cells separated.....2
2. Postocular and mesopleural bristles lacking (*Themira* group)..3
   At least mesopleural bristles always present.....6

3. Humeral bristle long and strong.....*Themira* Rob.-Desv.
Humeral bristle lacking.....4
4. Occiput in profile shallowly rounded, front and occipital tangents crossing at a very obtuse angle; thorax dully shining.....5
Occiput swollen; frontal and occipital tangents crossing at almost a right angle; thoracic dorsum shining black, sometimes more or less lightly brown pruinose.....*Enicomira* Duda
[One species, *E. minor* Haliday.]
5. Abdomen shorter than wings; sternopleura entirely pruinose; fifth abdominal tergite of male with strong marginal bristles. ..... *Enicita* Westwood
Abdomen longer than the short, narrow wings; sternopleura shining black; fifth tergite of male without strong marginal bristles .....*Cheligaster* Macquart
[One species, *C. leachi* Mg. (Europe).]
6. One strong orbital bristle on each side; abdomen of both sexes without macrochaetae 7
Orbital bristle minute or absent; humeral bristle present.....9
7. Humeral bristle lacking; vibrissae duplicate; abdomen not constricted laterally between second and third segments..... .....*Decachaetophora* Duda.
[One species, *D. aeneipes* De Meijere.]
Humeral bristle present 8
8. Only one pair of strong dorsocentral bristles and one pair of strong vibrissae; abdomen without constriction between second and third segments.....*Meroplius* Rondani
[One species, *M. stercorarius* Rob.-Desv.]
Three pairs each of strong dorsocentrals and vibrissae; abdomen constricted between second and third segments..... ..... *Meropliosepsis* Duda
[One species, *M. sexsetosa* Duda (Costa Rica).]
9. Fore femur of both sexes not emarginate, with or without bristles in rows.....10
Fore femur of male more or less cut out below.....11
10. Second longitudinal vein with a large, oval black spot at end; venter and mid and hind femora of male with long, thick hairs ..... *Sepsidimorpha* Frey
[One North American species, *S. secunda* Melander and Spuler.]
Second longitudinal vein not spotted at end..... ..... *Nemopoda* Rob.-Desv.
[One recognized North American species, *N. cylindrica* Fabr.]
11. Abdomen of both sexes without distinct macrochaetae, although sometimes with somewhat longer and stronger hairs on the hind margins of the tergites and strong anal bristles; end of second longitudinal vein not spotted; sternopleura pruinose only on upper border.....*Palaeosepsis* Duda.
Abdomen of the male, often the female also, with distinct macrochaetae; end of second longitudinal vein with a dark spot; sternopleura entirely pruinose.....*Sepsis* Fallen.

SEX ANOMALIES IN THE GENUS ASHMEADIELLA (HYMENOPTERA) WITH NOTES ON THE HOMOLOGIES BETWEEN MALE AND FEMALE GENITAL APPENDAGES

BY CHARLES D. MICHENER
American Museum of Natural History, New York City

Comparable sex anomalies of two different species of the genus *Ashmeadiella* [*A.* (*Ashmeadiella*) *opuntiae* (Cockerell) and *A.* (*Chilosima*) *rhodognatha* Cockerell] were collected in the desert portion of Riverside County, California, during the spring of 1936. Both individuals are bilaterally symeterical and present a blending of male and female characteristics, with, in addition, certain features common to both intersexes but not found in normal specimens of either sex. The two anomalous individuals are primarily female although the mandibles are of a modified male type and the claws are cleft as in males. The sixth abdominal terga show at least suggestions of the dentation found in normal males (figs. 5 and 10). The clypeus of each is abnormally produced, with its anterior margin thickened and crenulate (figs. 2 and 8), in a manner different from normal individuals of either sex. Furthermore, the mandibles are shorter than in either sex and have a large rounded, somewhat irregular thickening or tubercle, not found in either sex, on their outer surfaces immediately basad of the teeth. It is an interesting suggestion that these two similarly anomalous specimens collected in the same area at virtually the same time may have been the result of comparable environmental conditions of some sort.

More complete descriptions of the characteristics which vary intersexually are given below. Unfortunately, from the standpoint of an examination of internal organs, both specimens were pinned and dried before their anomalous features were observed.

Ashmeadiella rhodognatha Cockerell

Facial pubescence as dense as in female; antennae twelve-segmented as in female; clypeus more strongly produced than in either sex, its apical margin thickened, irregularly undulate; mandibles tridentate, strongly thickened just before teeth, shorter than those of normal male; mesocutum rather coarsely punctate as in female; tarsal claws cleft, as in male; sixth tergum (morphological seventh) with posterior margin strongly bilobed medi-

ally and with a small lobe at either side (thus intermediate between male and female); abdominal sterna without scopa, the fourth (morphological fifth) with three small lobes along its posterior margin, which is entire in normal specimens of both sexes; sterna beyond the sixth absent, as in female. The peculiar seventh and eighth terga and genitalia are discussed below.

Five miles west of Indio, Riverside County, California, April 10, 1936, on flowers of *Prosopis chilensis*, collected by the author.

ASHMEADIELLA OPUNTIAE (COCKERELL)

Similar to normal female, antennae being twelve-segmented; clypeus more strongly produced and more broadly truncate than in either sex, its apical margin thickened and irregularly undulate; mandibles slightly shorter than in normal male, thickened and tuberculate just before teeth, apices bidentate, inner tooth small; tarsal claws cleft, as in male; sixth (morphological seventh) tergum similar to that of female but with four feeble lobes, suggesting the characteristic teeth of the male; sternal scopa present, somewhat sparse; sting and associated organs as in female.

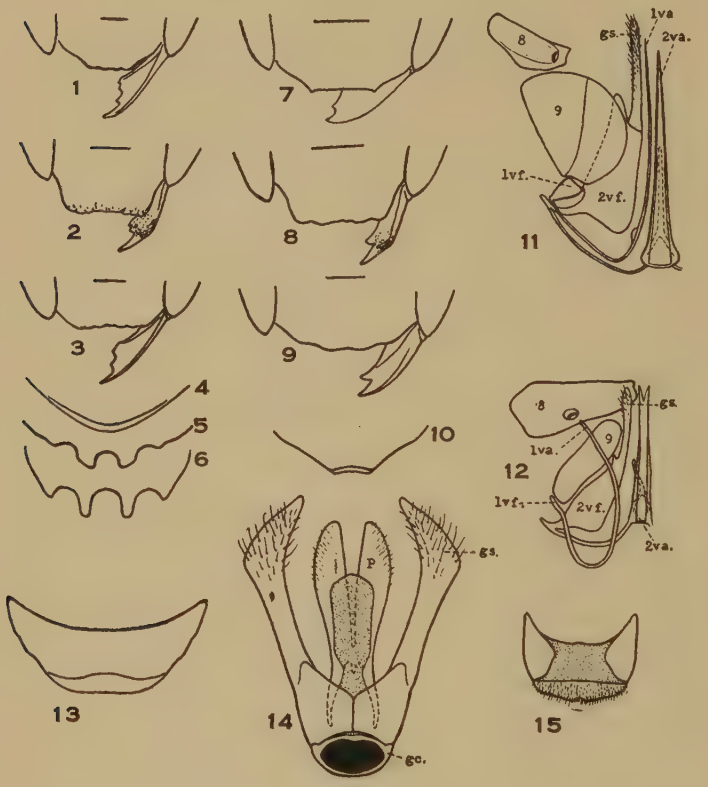
Cathedral City, Riveride County, California, April 9, 1936, on *Echinocactus cylindraceus*, collected by Dr. E. G. Linsley to whom I am indebted for the opportunity to study this specimen.

As may be seen from these descriptions, the specimen of *opuntiae* closely approaches the normal female, while that of *rhodognatha* falls near the midpoint between the two sexes. It may be supposed that each intersex developed as one sex for a part of its life, after which it developed as the opposite sex.

A study of the genital structures of the intersexual individual of *rhodognatha*, in which these parts are involved in the anomaly, is highly interesting and possibly significant in establishing the homologies of these parts. Since many other structures of the insect present a condition intermediate between that of the male and that of the female, it may be assumed that the genital structures, being different from those of the normal female, also approach the condition found in the male.

A superficial examination indicates that this supposition is correct. As will be seen from a study of figures 11 and 12, the eighth (counting the propodeum as first) tergum is larger and its parts more closely approximate in the intersex than in a normal female, while the ninth tergum is smaller than in the normal

female. Both of these are modifications in the direction of maleness. In the intersex the first valvifers are much reduced in size,



Explanation of Figures

1. Lower portion of face of *Ashmeadiella rhodognatha* Cockerell, female. 2, Same, intersex. 3, Same, male.
4. Apex of seventh tergum of *Ashmeadiella rhodognatha* Cockerell, female. 5, Same, intersex. 6, Same, male.
7. Lower portion of face of *Ashmeadiella opuntiae* (Cockerell), female. 8, Same, intersex. 9, Same, male.
10. Apex of seventh tergum of *Ashmeadiella opuntiae* (Cockerell), intersex.
11. Sting and associated structures (omitted on right side) of *Ashmeadiella*, female.

and instead of actually articulating with the ninth tergum and second valvifers, their angles merely approach the points of articulation on these sclerites and are separated from them by small membranous intervals. Furthermore, the first valvulae are blunt and loosely curled anteriorly, not forming stylets in the sting. If these reductions are in the direction of the male, it may be assumed that the first valvifers and valvulae disappear in the male, and it is true that no homologues of these structures are present in that sex, the eighth abdominal segment, as in other male Pterygota, being devoid of appendages. The second valvifers of the intersex lack the usual posterior processes and articulate with the second valvulae directly at their posterior inner angles. The third valvulae are immovably fused at the extreme anterior ends of the second valvifers, although in the female they are articulated subapically. The second valvulae are fused and swollen basally, somewhat as in the female, but are slightly separated at the apices.

The appenadges of the ninth abdominal segment, that is, the second valvifers with the second and third valvulae, in this intersexual individual bear a strong resemblance to the genital armature of the male (figure 14). If this resemblance indicates homology (and from the standpoint of position with regard to adjacent sclerites there is no reason to believe that it does not), the basal ring (cardo) must represent the fused basal parts of the coxopodites (second valvifers) of the ninth abdominal segment. The claspers or lateral portions of the male genital armature, two-segmented in most Hymenoptera but fused into un-

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12. Eighth and ninth terga and appendages of eighth and ninth segments (omitted on right side) of *Ashmeadiella rhodognatha* Cockerell, intersex.
13. Eighth tergum of *Ashmeadiella*, male.
14. Genitalia of *Ashmeadiella*, male, ventral view, apex upward to correspond to positions of genital appendages of female and intersex.
15. Ninth tergum of *Ashmeadiella*, male.

8, eighth hemitergite; 9, ninth hemitergite; *1vf.*, first valvifer; *1va.*, first valvula; *2vf.*, second valvifer; *2va.*, second valvulae; *gs.*, gonostylus; *gc.*, gonocardo; *p.*, penis valve. Abdominal segments are numbered with the propodeum as one, the first metasomal segment as two.

jointed organs in the Megachilidae, represent the remainders of the second valvifers and the third valvulae; the third valvulae of the female are thus the homologues of the styli (or parameres of Snodgrass, 1941, Smithsonian Misc. Coll., 99(14):18) of the male genitalia. Furthermore the penis valves or sclerotizations of the median part of the male genitalia may be homologous to the second valvulae of the female. Thus, in contrast to recent opinions (Snodgrass, 1935, Principles of insect morphology, ix + 667 pp., 319 figs., McGraw-Hill Book Co.; 1941, Smithsonian Misc. Coll., 99(14):1-86, 6 figs., 33 pls.) all these sclerotic organs would be regarded as periphallic and appendicular in origin, and the membranous intromittent organ itself is the only phallic structure in the male genitalia of the Hymenoptera.

Popov (1935, Rev. Ent. U.R.S.S., p. 162) figures the genitalia of a specimen of *Andrena* in which all the female structures were present and in addition the male genital structures of the right side of the body. This suggests that the entire male genital aramture is phallic in origin since the appendage of the right side of the ninth abdominal segment could hardly produce both male and female structures complete. However, too much weight should not be placed on such an asymeterical monstrosity, and indeed Popov (1937, Bull. Acad. Sci. U.R.S.S., pp. 487-498) in another paper gives figures of a gynandromorphic *Halictus* which suggests the same homologies between male and female genital structures as are indicated by the intersexual *Ashmediella*.

These same homologies have also been strongly supported by comparative studies of the structures of other insects which will be reported upon in another paper. They are summarized thus:

FEMALE	MALE
first valvifer	absent
first valvula (gonapophysis)	absent
second valvifer	cardo and gonocoxite (or basal segment of outer clasper)
second valvula (gonapophysis)	penis valve?
third valvula or gonostylus	gonostylus (or distal segment of outer clasper)

ADDITIONAL NEW SPECIES OF WEST AMERICAN COLEOPTERA

BY EDWIN C. VAN DYKE
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Family Buprestidae

Acmaeodera linsleyi Van Dyke, new species

Elongate, subcylindrical, of moderate size; bronzed, the head, pronotum and underside with a greenish tinge, the elytra a bit brownish; head and pronotum somewhat densely clothed with fine, long, fulvous pile, elytra less dense but similarly clothed and the underside moderately clothed with gray, more or less inclined pubescence; the prothorax generally immaculate though often with a small, yellow spot at the sides behind the middle, the elytra with yellow markings of a somewhat stable type as follows: a small spot at the side below the humeral umbone; an oblique band behind the umbone, reaching the third interval where generally expanded both in front and behind and outwardly reaching the margin and continued backwards for a short distance; a second and broad transverse or slightly oblique patch at the middle, reaching from the margin to about the third or fourth interval; a narrower oblique bar between the above and the apex, touching the margin but not the suture, and generally a small spot on the margin in front of it which is sometimes united with it; and a subapical lunate spot, often united along the margin with the preceding or sometimes interrupted. Head coarsely, approximately punctured, feebly longitudinally impressed at middle and transversely impressed at base of clypeus; the antennae reaching middle of prothorax, segments 5-11 serrate. Prothorax almost twice as broad as long, somewhat wider than elytra, apical margin biemarginate, the median lobe quite evident, sides arcuate or subangulate, the margin narrow, not reflexed and scarcely visible posteriorly, as seen from above, the base transverse; the disk rather coarsely, closely, often approximately punctured, the median longitudinal impression well marked and the oblique impressions within the hind angles also quite evident. Elytra about twice as long as broad, sides almost parallel or feebly sinuate from base to behind the middle, thence narrowed to apex; the disk with triangular depression at middle of base, the humeral umbone quite prominent, a small impression just within, the striae shallowly impressed and moderately coarsely, rather deeply and closely punctured, intervals flattened at center, feebly convex at sides and the third sometimes elevated and carinated at base. Beneath, coarsely, densely punctured in front, more finely, less densely punctured on ventral plates. Prosternum broadly, feebly, sinuate on anterior margin.

Last ventral with thin somewhat transverse ventral plate. Length, 6.5-9 mm.; breadth, 2.5-3.5 mm.; average, 8 mm. long by 3 mm. wide.

Holotype (No. 5336, Mus. C. A. S. Ent.) and numerous designated paratypes from a series of over one hundred specimens, collected by E. G. Linsley, E. S. Ross and other at PINON FLAT, SAN JACINTO MOUNTAINS, RIVERSIDE COUNTY, CALIFORNIA, on various days during May, 1939.

This species belongs in the *Acmaeodera sinuatae* group, although the sinuation of the anterior margin of the prosternum is feeble. According to Fall's key, this species would run close to *convicta* Fall but it bears no close resemblance to that or any other member of that group except possibly some specimens of *hepburni* Lec. It is in general more cylindrical, has the prothorax always slightly broader than elytra, and the elytral markings, more sharply outlined, generally somewhat transverse, and suggesting to a certain degree the markings of *flavostica* Horn. Most of the specimens were collected from the blossoms of the salmon colored *Sphaeralcea fendleri* var. *californica* Parish. It is apparently quite local in distribution.

Acmaeodera moronga Van Dyke, new species

Moderately long, robust, cuneiform, of medium size; bronzed and shining, the elytra black or bluish-black; head, and pronotum somewhat densely clothed with fine, long pile, that of the head in great part gray, that of the pronotum fulvous as is also the much sparser erect pile of the elytra, the underside clothed with long gray, much inclined pile, denser at the sides; the prothorax with a lateral yellow patch extending from near the base generally to about the middle, the elytra with the yellow markings about as follows: a narrow yellow marginal line extending from base almost to the median yellow bar, in a few cases not reaching base, a narrow oblique bar behind the humeral umbone, generally connected with the marginal line and expanded inwards, a broad median band, oblique or even arcuate forwards, sometimes united with the anterior band and often with the terminal portion separated as a spot, a short almost transverse bar between median and subapical bar, often broken or even bifurcated at the margin, and the subapical lunate marking, often broken up into two or three spots. Head moderately, coarsely, closely punctured, rather deeply, longitudinally impressed at middle, often with a smooth area at bottom of groove, transversely impressed at base of clypeus; the antennae about reaching middle of prothorax, segments 5-11 broadly serrate. Prothorax over twice as broad as long, broadest

at base, apical margin biemarginate, sides arcuate, gradually narrowed apically, the margin narrow and not visible posteriorly from above; the disk rather coarsely and densely punctured, approximate at sides, the median longitudinal impression well marked, deeply and triangularly impressed at base, and the oblique impressions within hind angles quite evident. Elytra twice as long as broad, sides feebly sinuate before the middle, gradually narrowed from base to posterior third, thence more acutely convergent to apex; the disk with a well-marked triangular depression at middle of base, the humeral umbone prominent, a slight groove at inner side, the striae moderately impressed, rather coarsely, not closely punctured fully their own width apart except near suture and in basal triangle, intervals somewhat flattened inwardly, convex at sides, and minutely, irregularly punctured, the third somewhat elevated and carinated near base. Beneath, rather coarsely, closely punctured in front, finely and sparsely on posterior ventral plates. Prosternum broadly sinuate in front. Last ventral plate with a broad yet feebly developed ventral plate. Length, 10 mm.; breadth, 4 mm.; several specimens but 8 mm long.

Holotype (No. 5337, Mus. C. A. S. Ent.) and five paratypes collected by myself in MORONGA VALLEY, RIVERSIDE COUNTY, CALIFORNIA, May 24, 1941, and various other dates close to that period.

This species, according to the key, would follow *serena* Fall, which it does not at all resemble. It has the general markings of *flavostica* Horn even to a greater degree than *linsleyi*, but differs by having the elytra black or bluish-black, by being less acuminate, less coarsely and more discretely punctured, with the pubescence sparser, as well as by having a different type of prosternal margin. From some specimens of *hepburni* Lec., it differs by being stockier, less elongate, by the coloration of elytra and less concentration of yellow toward the base.

FAMILY SCARABAEIDAE

Polyphylla peninsularis Van Dyke, new species

Rather short and stocky, brown, the prothorax generally quite rufous, the palpi, antennae and legs rufous, the head and pronotum clothed with long, silky, erect, light brown pile; the elytra with the usual sutural, two discal and submarginal white stripes formed by the densely placed white scales, the stripes narrowing posteriorly, with irregular margins and often somewhat interrupted, the humeral stripe a short line at most, and the areas between the stripes peppered with short, light yellowish scales. Head with rather coarse and shallow punctures; clypeus with reflexed

margins, the sides straight and parallel or slightly diverging forwards, the front margin transverse or very feebly biemarginate at most and with outer angles hardly rounded; the antennae with a club that is about 6 mm long, 2 mm longer than head, the outer lamellae decidedly curved and distally averaging 1.5 mm, in width; the terminal segment of labial palpi at least three times as long as broad. Prothorax convex as usual, apical margin emarginate, the sides subangulate, the lateral margin entire or feebly crenulate posteriorly at most, the hind margin broadly lobed; the disk coarsely, shallowly, irregularly punctured, with the usual three scaly vittae, the median complete, the two lateral incomplete in front, the rest of the surface with scattered scales and the long, erect hair, generally longer and denser in front. Elytra over one-third longer than wide, with the surface irregularly, shallowly punctured, rugose and somewhat shining where not covered with scales, the apices broadly rounded and the sutural angles quite obtuse. Pygidium parabolic in shape, with narrow, reflexed margins and rather densely clothed with short, yellowish hair and white scales that are about twice as long as broad. Foretibiae bidentate in the male, the female not seen. Length, 23 mm.; breadth, 11 mm.

Holotype male (No. 5338, Mus. C. A. S. Ent.) and seven paratype males, collected at La Grulla, 7000 feet alt., in the San Pedro Martir Mountains of Baja California, June 19, 1923, by J. R. Slevin.

This rather small and interesting *Polyphylla* belongs in the group characterized by the long pile on the pronotum. According to Casey's key (Mem. Coleopt., V, 1914, pp. 322-353), this species would run close to *diffracta* Casey (*fuscula* Fall), which is of about the same size and general appearance but differs from *diffracta* by being a bit broader, by having the silky pile of the head and pronotum much denser, longer and finer, by having the last labial palpal segment, a bit narrower, the outer angles of the clypeus less acutely angulate, the antennal club about 1 mm. longer, the lateral margins of the prothorax behind not conspicuously crenulate as they are in *diffracta*, the sutural angles of the elytra obtuse, not sharply right angled, the pile of the legs long and silky, not rather short and stiff, and the pygidium less acute and angulate. This species appears to be even more closely related to the recently described *barbata* Cazier, which is somewhat shorter, with the long pile of the pronotum as dense behind as anteriorly, with the clypeus more expanded in front and its angles more rounded, and the scales of both elytra and pygidium longer and narrower, more hair-like.

Thyce aurata Van Dyke, new species

Short and robust, rufous, the scutellum and elytra densely clothed with small, golden brown scales, the head and pronotum also with numerous scales of similar nature and in addition ornamented with rather long erect pile. Head rather finely, closely punctured; clypeus expanded in front, with reflexed margins, transverse apical margin and narrowly rounded outer angles; the antennae with club about as long as funicle and the terminal segment of labial palpi, as long as antennal club, elliptical in shape and with a deep sulcus on upper face running the entire length yet somewhat more widely expanded basally. Prothorax convex, apex emarginate, sides subangulate with margin feebly crenulate posteriorly, the base broadly arcuate; disk finely, closely punctured and with median longitudinal impression feeble. Elytra over one-fourth longer than broad, with the surface finely, closely punctured like the pronotum, and the sutural angles right angled. Pygidium with lateral margins slightly reflexed in front, the surface finely closely punctured and densely clothed with scales that are somewhat longer and narrower than those of the elytra. Beneath the forebody densely clothed with long, light brown pile, the abdomen rather finely punctured and quite well covered with scales which are quite similar to those of the pygidium. First tibiae with the middle and apical teeth well developed, the basal a broad tubercle; the middle tibiae with two short yet well-marked spines on the outer face. Each tarsal claw with a small, erect tooth near its base. Length, 20 mm.; breadth, 9 mm.

Holotype male (No. 5339, Mus. C. A. S. Ent.) and one male paratype, collected at San Diego, California, by Dr. F. E. Blaisdell. Associated with these two specimens is a large female, also collected by Dr. Blaisdell which I presume is the female of this species. It is 24 mm. long by 11 mm. broad, almost naked above, the head, pronotum and scutellum sparsely clothed with suberect, fulvous pile, the elytra with only a few minute fulvous scales scattered over the elytral declivity and carried over onto the pygidium. The head is densely, cribately punctured, with a prominent frontal tubercle, the clypeus quite similar to that of the male but with the margins more reflexed and the outer angles more rounded; the antennal club hardly two-thirds as long as the male club and the last labial palpal segment narrow and about half the length of that of the male. The pronotum is densely, coarsely punctured, with a small, smooth area at center and the side margins behind strongly crenulated. Beneath, the forebody, rather densely clothed with long, fulvous pile, the abdomen quite smooth and sparsely peppered with very small,

hair-like, yellowish scales. Front tibiae distinctly tridentate, the middle tibiae with a pronounced tubercle at middle and a small spine above, on outer face.

This species in Casey's key would run somewhat near *fossiger* Csy. but it is much shorter, has an entirely different type of vestiture and is quite different structurally in many regards. What I take to be the female is also much more like the female of *blaisdelli* Csy. than that of *fossiger* Csy. The subspecies *ochreata* Csy. of *fossiger* approaches *aurata* as regards the color but the scales are less dense and of a different type.

Thyce cinerea Van Dyke, new species

Rather small, reddish brown, the head and pronotum darker, also densely clothed with long, erect, silky, very light yellowish gray pile, and addition with a covering of closely applied long, white, hairlike scales, rather dense on the head, sparser on the pronotum where most evident as a broken, median longitudinal vitta, and dispersed patch at the sides; the scutellum densely clothed with somewhat larger white scales and the elytra clothed with white, hairlike scales, somewhat like those of the head and pronotum, which though closely applied are not approximate, thus do not conceal the surface of the elytra. Head rather coarsely, densely punctured; clypeus moderately expanded in front, with margins well reflexed, the front margin broadly emarginate and the outer angles well rounded; the antennae with club about as long as funicle, and the terminal segment of labial palpi but slightly shorter, somewhat elliptical in shape and with a deep, rather wide groove on the upper side running the entire length. Prothorax convex, apex feebly biemargainate, sides arcuate or feebly subangulate, the outer angle broadly rounded, the margin strongly crenulate behind, the base with prominent median lobe; disk with moderately coarse, rather closely placed variolate punctures, without defined median impression. Elytra over one-fourth longer than broad, the surface rather finely, closely punctured, the apex feebly truncate and the sutural angles right angled. Pygidium subangulate, with narrow, feebly reflexed margins, and punctured and clothed like the elytra. Beneath, the forebody densely clothed with the long, silky, light yellowish gray pile, the abdomen rather densely, finely punctured and moderately closely covered wtih long, hairlike white scales. Front tibiae with the upper tooth very obtuse and low, the middle and terminal, acute and promnient; the middle tibiae with the spines very small, barely indicated. Tarsal claws with basal tooth small and acute. Length, 19 mm.; breadth, 9 mm.

Holotype male (No. 5340, Mus. C. A. S. Ent.), a unique col-

lected at BALBOA, CALIFORNIA, in July by Dr. Harold Bryant and by him kindly presented to me.

This rather small species because of its silvery gray color stands well apart from its fellows. It is evidently a sand dune species like *pistoria* and others, but these are more robust in every regard and clothed with fulvous or yellowish scales and pile.

Thyce clypeata Van Dyke, new species

Of moderate size, robust, brown or reddish-brown, the head and pronotum clothed with fine, erect, rather long fulvous pile and in addition with closely appressed, elongate, yellowish scales, dense on the head, less dense on the pronotum, though rather concentrated in the form of a median longitudinal vitta and a broader, less sharply defined vitta on either side, the scutellum densely clothed with somewhat broader white scales, and the elytra rather uniformly, moderately closely clothed with small, elongate, very light fulvous scales, the vestiture thus only slightly concealing the surface beneath. Head rather closely punctured; clypeus expanded in front, the sides notched or sinuate in front of the lateral angles, the anterior margin feebly emarginate at middle, the margins well reflexed and the anterior angles though blunt, decidedly angulate; the antennae with club fully as long as the funicle, the last labial palpal segment two-thirds as long as antennal club, rather wide and with a moderately wide and deep groove extending the entire length along the upper surface. Prothorax convex, apex feebly biemarginate, sides subangulate, feebly crenulated behind, the base broadly subangulately lobed; the disk rather coarsely, densely punctured, the median longitudinal impression shallow but evident. Elytra less than a third longer than broad, the surface finely, closely punctured, the apex broadly rounded, subtruncate, with sutural angles slightly obtuse. Pygidium subangulate, with feebly reflexed margins, finely, closely, punctured, and moderately densely clothed with narrow, very light colored hairlike scales, much narrower and longer than those of elytra. Beneath, the forebody densely clothed with long, fine, light grayish yellow pile, the abdomen rather finely, densely punctured and clothed with closely adherent long, white hairlike scales. Front tibiae tridentate, the upper tooth broad yet prominent; the middle and hind tibiae both with two well-marked spines on outer margin; middle tarsi longer tahn tibiae. Tarsal claws each with an acute and prominent tooth near base. Length, 23 mm.; breadth, 11 mm.

Holotype male (No. 5341, Mus. C. A. S. Ent.) and two paratype males, collected near PETALUMA, CALIFORNIA, by E. C. Johnston. Two of the specimens are alike and normal, the third has the fore tibiae with the spines all much reduced, the outer margin merely sinuate.

Superficially this northern species looks more like some of the southern species as for instance *fossiger*, which it superficially simulates though is larger and more robust, than it resembles species like *harfordi* or others from the north. Its most distinctive character is its clypeus, with lateral margin sinuate before apex and the angles more prominently angulated as a result.

Family Curculionidae

Pandeleteius viridissimus Van Dyke, new species

Of rather large size for the genus, black, antennae and tarsi rufous, the entire upper and under surface covered with brilliant, circular, green scales. Head medianly sulcate in front, beak short, 1 mm. long, triangularly emarginate at apex, eyes moderately convex, antennae about reaching middle of prothorax, with a fine, sparse pubescence, first segment of funicle stout, almost as long as the second and third segments combined. Prothorax about one-fifth broader than long, apex and base transverse, sides broadly rounded at middle, sinuate in front and behind; disk feebly convex, with well defined anterior and posterior submarginal impressions, and with a few fine obliquely placed hairs as on the head. Elytra transverse at base, sides almost straight, gradually wider to posterior third then rounded to somewhat projecting and acute apex; disk moderately convex, somewhat bulbous laterally behind, the striae complete and finely impressed, the intervals flat and with a single row of fine short and sparse, upright hairs, most evident on the posterior declivity. Beneath with abdomen finely, sparsely pilose and with first ventral suture moderately arcuate at middle. Anterior femora enlarged, fusiform, the tibiae long and strongly denate within. Length, 9 mm.; breadth, 4 mm.

Holotype (No. 5342, Mus. C. A. S. Ent.) and one paratype, collected by myself on the western slope of Montezuma Pass, Huachuca Mountains, Arizona, August 19, 1940. They were apparently feeding on the foliage of *Calliandra eriophylla* Benth., an accacia-like plant wth pink flowers.

This brilliant green species, of rather large size, should be readily separated from its more somber relatives. Some of the scales are apt to be rubbed off, exposing the black epidermis and thus giving the insects the appearance of being peppered.

TWO NEW COCCINELIDAE FROM OREGON[1]

(Coleoptera)

BY BORYS MALKIN

Eugene, Oregon

In the preparation of a check list of Oregon Coccinellidae the writer discovered a species each of *Scymnus* and *Hyperaspis* apparently unknown, the descriptions of which are given below:

Scymnus fenderi Malkin, new species

Oblong oval; black. Head reddish toward the clypeal apex, shining; punctures distinct similar to those on thorax, more closely set toward the eyes. Front and part of clypeus slightly convex. Thorax strongly converging and arcuate in apical half, narrower at the base than elytra; black with sides triangularly yellow. The yellow area covers nearly one-fifth of the apex on each side. Hind angles black. Thoracic punctures as in *caurinus* distinct, sparse, but denser and smaller toward the sides, especially in apical portion. Elytra longer than wide, entirely black. Elytral punctures irregular, very closely set, more shallow toward the sides, especially in apical portion. Undersurface black. Legs bright reddish-yellow, with femora darker in basal half. Labrum and palpi reddish-piceous. Prosternum margined. Prosternal ridges not very strong, distinct, converging in the front. Metasternum coarsely and densely punctured, almost as deeply as elytra, but punctures sparser and more shallow toward the middle where they become transverse. The middle of the metasternum deeply impressed, with a small tubercle on each side of the impression. Epipleura and side pieces of metasternum so closely punctured as to appear tuberculate. The side pieces narrow, sharply pointed, more than three times wider at base than in the front. Prosternal plates reaching the lateral margins of the metasternal episterna, and occupying seven-tenths of the prosternum. First segment of the abdomen flattened between the abdominal plates, with denser punctures toward the front of the flat area. Second segment strongly convex in the middle, the following segments less convex. Second and third segments with a deep, curved impressions on sides. Segments four and five with smaller shallow impressions in some distance from lateral margins. Abdominal plates incomplete, regularly curved, four-fifths as long as the segment. Pubescence on the dorsal side thick, yellow recumbent. Length: 2.5 mm.; width, 1.8 mm.

[1] This paper was prepared at the University of Oregon.

Holotype, female from CAMAS VALLEY, on Roseburg-Coquille Highway, DOUGLAS COUNTY, OREGON, June 15, 1936; in author's collection. This specimen was collected by Mr. K. Fender after whom it is named.

This species runs to *caurinus* in Casey's key, from which it can be easily distinguished by the unusually coarse elytral punctures, coarser punctulation of the abdominal segments and presence of the impressions on the lateral portion of those segments.

Fig. 1. *Hyperaspis obscura* Malkin, male holotype.

Hyperaspis obscura Malkin, new species

Elongate oval; strongly converging; black; highly polished. Lateral margin of thorax yellow. The vittae broad in front, sinuate from the inside at the apical portion, gradually narrowing toward the base where they occupy the angles only. Elytra, each with two spots. The anterior spot located along the middle of the lateral angle, almost one-fifth as long as elytron. The posterior spot smaller and somewhat indefinite, located in the apical portion of the elytra, not touching the margin. Head black in male, yellow in female; densely and minutely but distinctly punctured. Thorax

as long as wide, with very distinct punctures more closely set toward the sides. Elytra slightly longer than wide, their punctures strong and large although less dense than those on thorax. Interstices very minutely alutaceous. Ventral surfaces closely punctured but punctulation less pronounced than on dorsal side. First two abdominal segments with highly polished median area, and short, sparse, delicate pubescence. Legs; femora reddish-piceous, tibia and tarsi dark reddish testaceous. Length, 2.3 mm.; width, 1.7 mm.

Holotype, male (No. 5292, Calif. Acad. Sci., Ent.), and allotype, female (No. 5293), both collected by Mr. Gentner at LAKE OF THE WOODS, KLAMATH COUNTY, OREGON, June 11, 1939. A male paratype with the same data in author's collection.[2]

This species belongs to the *undulata* group in Dobzhansky's recent revision of the genus, but closer specific affinities cannot be established with certainty until a larger series is available.

The extent of the anterior elytral spot varies within the series. In the female it is only half as long as in the male holotype, and four-fifths as long in the male paratype. The female is slightly larger than either male. Otherwise the specimens show very little variation.

Acknowledgments: The writer is indebted to Mr. and Mrs. Kenneth Fender of McMinnville, Oregon, and Mr. L. G. Gentner of Medford, Oregon, for the loan of material used in present study. To Miss Edith A. Onthank, a University of Oregon student, for the drawing af *Hyperaspis obscura* and to Dr. L. S. Cressman of the Anthropology Department for the permission to use his excellent Leitz-Wetzlar microscope.

[2] A female specimen has come to my attention since the present paper was submitted for publication. It was collected by Mr. and Mrs. Kenneth Fender at Diamond Lake, Lincoln County, Oregon, in the Cascade Mountains, on June 7 1941. The elytral pattern is intermediate between the type material described above. I have designated this specimen as a metatype and it is deposited in the Fender collection.

THE EFFECT OF LOW STORAGE TEMPERATURE ON REPRODUCTION IN CERTAIN PARASITIC HYMENOPTERA

BY PAUL DE BACH
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In population studies involving the rearing of *Musca domestica* L. and its pupal parasites, *Mormoniella vitripennis* (Walker) and *Muscidifurax raptor* Gir., it was found necessary at times to resort to storage by refrigeration in order to synchronize parasite emergence with host production. Storage of adult parasites at low temperatures has, for many years, been practiced by those engaged in biological-control work, both for long-distance shipping of parasites and for proper timing of parasite emergence and liberation. It appears, however, that an adequate general study of the effect of cold storage on insects has never been made, and, as a result, the utility of the method has not been fully realized, especially as regards storage of parasites for any length of time. The fact that results are sometimes adverse has doubtless inhibited investigational work. It is to be hoped that future work will clear up many of the present problems in this important field.

The chief value of cold storage should lie in the *introduction* phase of biological-control work rather than in mass *production*, since the former is concerned with any means of establishing the species, while the latter is more concerned with maximum reproduction after establishment, in order to accomplish complete distribution over the infested area at as early a date as possible. Emphasis should be placed on the fact that in introduction work the percentage mortality or sex-ratio reverses are relatively unimportant so long as sufficient numbers of parasites are sent initially to insure even a few for breeding stock.

Cold Storage of Adult Parasites.—In the present studies, the cold-storage method was found to be quite successful. Parasites were held first as adults, by storage at 4.4° C. Adults of *Mormoniella* and *Muscidifurax*, whose life expectancy in the laboratory is one to two weeks, live as long as five months at this temperature if they are removed at intervals of 3 or 4 days for feeding, although mortality is fairly high after such a long

period. The fecundity of the surviving adults does not appear to be impaired, and the sex ratio of the progeny is favorable. Adults of *Mormoniella vitripennis* and *Muscidifurax raptor* survived five months; adults of *Pachycrepoideus dubius* Ash. and *Microbracon* sp., four months.

Results of tests with *Mormoniella* adults serve to confirm the observations noted above. Four hundred and thirty-three *Mormoniella* reared at 27.5° C. were refrigerated at 4.4° C. from June 6, 1939, to July 13, 1939, or for a total of 37 days. At intervals during this time they were removed from refrigeration and fed honey. The initial age of the paarsites was from 3 to 5 days after emergence. After 37 days of refrigeration, 105 adults remained alive. (Mortality could undoubtedly be decreased by more uniform feeding periods than were used.) These 105 adults were removed from refrigeration and put with housefly puparia in which they were observed to oviposit. From these puparia 289 adults emerged, two-thirds of which were females and one-third males.[1] These data indicate that neither spermatoza nor ova are materially affected by refrigeration of the adult.

The principle of cold storage of insect parasites is, of course, to lower the rate of metabolism so that longevity is increased. This phenomenon is well known, but the exact effects are not well understood. According to Wigglesworth (1939, p. 344),

"In insects exposed to low temperatures, the R. Q. may fall to a very low figure . . . The low temperature seems to cause some disturbance in metabolism, the nature of which is not known. The values at the low temperature are too low to be explained by an exclusive oxidation of fat, and too prolonged to be explained by the increased solubility of gases in the tissue fluids."

Even though the process of cold storage is logically sound, certain complicating factors enter, so that a greater or less amount of mortality occurs, as previously pointed out. Wigglesworth (1939, p. 364) says:

"[Many insects] accustomed to warm surroundings . . . soon die even at temperatures well above freezing-point. The cause of death is not understood. It is often attributed to the accumulation of toxic products which at normal temperatures would be eliminated . . . This type of effect by cold is sometimes termed the 'quantity factor' because it must act for some time before it causes death."

[1] *Mormoniella* exhibits arrhenotokous parthenogenesis.

The mortality obtained in the present study was undoubtedly due to several factors which would be very difficult to analyze separately. Freezing is, of course, a direct cause of mortality but is not to be considered here, since freezing temperatures were not used in these experiments. It should be pointed out, however, that some insects can actually withstand freezing without adverse effects. One possible cause of mortality—one readily thought of—is starvation. Even though parasites are held at a low temperature, a certain amount of metabolism occurs; and, unless the energy lost is regained by periodical feedings and subsequent assimilation of food, death by starvation may result. This is supported by the repeated observation that periodical removal from storage to permit feeding on honey greatly reduced mortality.

A further cause of mortality, sometimes not readily associated with cold storage, may be dessication. Because of the continued removal of moisture in the form of ice, the air in an electric refrigerator of the coil type, such as that used in the present experiments, is very dry. Various authors have shown that low humidity may be a cause of death by means of desiccation. At low temperatures, loss of moisture by the insect would occur very slowly, but this is a factor to be considered, unless parasites are stored in tightly corked vials instead of in those having the usual cotton plug. Van Steenburgh (1934) states that larval parasite mortality during cold storage appears to be due to desiccation of the host egg. And according to Lund (1934, p. 335-36),

" . . . the mortality of the parasites and unparasitized host eggs generally decrease regularly with an increase in humidity at all temperatures—the mortality apparently varying more with humidity than with temperature."

Since the experiments involving cold storage of adult *Mormoniella* and *Muscidifurax* indicated distinct possibilites for this method of shipping refrigerated parasites, it was thought desirable to run tests on storage of their immature stages at low temperatures in order to ascertain whether or not any adverse effects of low storage temperatures on these stages might be evidenced. As a consequence, experiments were designed to test the effect of cold storage on immature stages of the two parasites, *Mormoniella* and *Muscidifurax*.

Cold Storage of Immature Stages.—A common procedure in biological-control work, as is well known, has been that of ship-

ping parasites in the larval or pupal stage in cold storage. Several authors have pointed out recently, however, that low storage temperatures may affect the fecundity of adult parasites thus exposed in their immature stages.

Van Steenburgh's (1934) most satisfactory results with *Trichogramma* pupae in host eggs stored 75 days at 35° to 45° F. showed little mortality but about 50 per cent reduction in fecundity.

Schread and Garman (1934) concluded that

"*Trichogramma* species reared in grain moth eggs are affected by refrigeration in the following ways. (a) At temperatures below 47° F. mortality is gradual and increases with the length of exposure. There is some survival with refrigeration extended to 72 days, but the percentage is so small that it is worthless for production purposes. (b) The sex ratio is upset when temperatures below 47° F. are employed, the change being more evident in the generation following than in the generation emerging from refrigerated eggs. (c) Wing deformity is directly proportional to length of refrigeration and indicates a general weakening of the indivduals."

Under the most adverse conditions tabulated by Schread and Garman (1934), that is, after storage for 39 days at 37° F. and 60 percent relative humidity, the emerging generation exhibited a 1:1 sex ratio, showing that even under such conditions loss of the breeding stock would not result. In an earlier paper, these workers (Schread and Garman 1933) give as the extreme figure a male preponderance of 23:1 in the first generation removed from adults that were subjected to storage at 38° F. and 60 percent relative humidity for 60 days in the pupal stage.

Hanna (1935) found that larvae of the parasite *Euchalcidia caryobori* Hanna were not affected when stored at 16° C. (60° F. +) for as long as 55 days, as shown by normal fecundity and sex ratio of the adults. The preponderance of male progeny from similarly treated pupae, however, indicates an adverse effect in the form of partial or complete sterilization. Male pupae are much more affected than are female. Low storage temperatures cause the retardation of spermatogenesis in the male and possible retardation of the growth of the eggs or ovarian malformation in the female. Flanders (1938) discusses and summarizes the effect of cold storage on the reproduction of parasitic Hymenoptera.

While the aforenamed authors clearly show a reduction in fecundity of adults or a male-predominant sex ratio in certain cases where immature stages of a parasite were subjected to prolonged cold storage, in none of the cases mentioned would this have resulted in loss of the parasite species in introduction, had any quantity of individuals been shipped in storage in both late larval and pupa stages.

The present experiment involved the subjection of full-grown larva of *Mormoniella* to each of the following temperatures: 0-2°, 6°, 10°, 15°, and 23° C. Those held at 23° emerged in 9 days; those held at 15° emerged in 28 days; the remainder did

Table 1.--Progeny of five groups of 50 Mormoniella female parasites which were subjected to storage at different temperatures during the larval stage, then removed and allowed to emerge, mate, and to oviposit, under uniform conditions, among 200 housefly puparia.

Group	Storage		Number of Hosts		Number of Adult Parasites Produced[1]		
	Temperature, in Degrees C.	Period in Days	Stung	Producing Adult Parasites	Male	Female	Total
1	0 - 2	31	120	50	264	238	502
2	6	31	111	47	234	290	524
3	10	31	90	28	117	177	294
4	15	28[2]	21	8	52	41	93
5	23	9[2]	17	5	10	21	31

1 Mormoniella is a gregarious parasite; as many as 15 may mature in one host.

2. Adults emerged during storage.

not emerge after being held 31 days, although those at 10° developed into pupae. The larvae held at 0-2° and at 6° showed no outward change. The fact that *Mormoniella* larvae matured and emerged when stored at 23° and 15° and pupated while stored at 10° indicates that the process involved at these three temperatures is nothing more than a slowing down of metabolism, and that development will proceed through to emergence at any temperature above the threshold of development if storage is sufficiently prolonged.

After being held at the different temperatures for the time indicated, the parasite larvae were removed, and the adults were allowed to emerge. Three days later, after feeding and mating had taken place. 50 females of each group were removed and placed with 200 housefly puparia in a quart jar. Oviposition occurred readily, and the parasite progeny matured and emerged in the usual time. These progeny were then counted, and the sex of each was determined. The results of these counts are shown in Table 1.

These data, contrary to what might have been expected from

previous work, indicate that the lower the temperature to which mature larvae of *Mormoniella* are subjected, the greater is the fecundity of the resulting adults. In the present experiments the number of hosts "stung" was considered to be the best measure of fecundity, since an egg was usually deposited when the host was stung. The number of adult parasites that emerged was somewhat variable, partly because of the factor of superparasitization. As a general practice, *Mormoniella* was reared at 27.5° C. in the laboratory. Under such conditions the total progeny approached the numbers obtained at 0-2° and 6° in

Table 2.--Progeny of three groups of 50 Muscidifurax female parasites which were subjected to storage at a temperature of 4.4° C. during immature stages, then removed and allowed to emerge, mate, and to oviposit among 200 housefly puparia.

Group	Stage Tested	Period of Storage at 4.4° C. in Days	Number of Hosts Stung	Number of Adult Parasites Produced		
				Male	Female	Total
1	Larval	28	200	47	70	117
2	Larval	31	200	59	49	108
3	Pupal	25	200	47	40	87
Control[1]			200	30	56	86

[1] Fourteen-day life cycle at 27.5° C.

Table 1. The reason for the low number of progeny obtained from those parasites reared at 15° and 23° is not at all clear, but this was possibly due to their remaining in cold storage for a short time after emergence. These data are of a preliminary nature and must be supplemented in order to determine the exact significance of the effects that have been noted. At least they show plainly that storage at such low temperatures is not harmful so far as reproduction is concerned.

The sex of the progeny of *Mormoniella* adults subjected to different temperatures in their full-grown larval stage, indicates no marked relation between temperature variations and sex ratio, although the data in Table 1 show a slight preponderance of males at 0-2° C. This could be interpreted as indicating that when stored as larvae at a temperature below freezing, males may be affected. The sex ratio for the entire group is 1.13 females to 1.00 male. On the other hand, the sex of adults which have been subjected to low temperatures in the immature stages is about 2.66 females to 1.00 male. Indications are that this may be the effect of differential mortality on the male larvae and pupae.

Experiments similar to those described above were conducted

with *Muscidifurax raptor*, but at only one temperature (4.4° C.). Since pupae had not been used in the previous experiments, they were included here. The results of the tests are given in Table 2. From the data in this table it is evident that even subjection of *Muscidifurax* pupae to prolonged low temperature does not result in the production of sterile adult males (as has been demonstrated for some species), since close to a 1:1 sex ratio was obtained.[2]

There does not appear to be any appreciable difference between experiments and control, either in reproductive capacity or in sex ratio of the progeny, although there are not sufficient data at hand to be evaluated statistically.

Summary and Conclusions.—Mature larvae and pupae of the pteromalid parasites *Mormoniella* and *Muscidifurax* spp. were subjected to storage for periods of 25 to 31 days at temperatures ranging from 0° C. to 23° C.; they were then removed, and the adults were allowed to emerge at a temperature of 27.5° C. Fecundity appeared to be highest in those adults whose immature stages had been subjected to the lowest temperatures. Apparently, immature male parasites were not sterilized at the low temperatures used in these studies, since the succeeding generation exhibited a normal sex ratio. The data obtained show no consistent effect of temperature upon the sex ratio.

Adult *Mormoniella*, *Muscidifurax*, *Pachycrepoideus*, and *Microbracon*, when given periodic feedings, may be held at low temperatures for periods of one to several months without material effect upon their reproductive processes, although mortality increases with length of storage.

In conclusion, it may be stated that, while in certain cases cold storage may, to some degree, affect sex ratios or fecundity, importation of parasites by the cold-storage method, either as adults or as immature stages, may well be feasible and may even be the most satisfactory method of shipment, especially when slow transportation over long distances is necessary. This would at least be the case with the parasites used in the present studies; and, if one may judge by the data of other authors, the method might be applied to many species for introductory purposes. Individual studies, however, will probably be desirable for each species concerned.

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[2] *Muscidifurax* like *Mormoniella*, exhibits arrhenotokous parthenogenesis.

Literature Cited

Flanders, S. E. 1938. The effect of cold storage on the reproduction of parasitic Hymenopetra. Jour. Econ. Ent., 31(5):633-4.

Hanna, A. D. 1935. Fertility and toleration of low temperature in *Euchalcidia carybori* Hanna (Hymenoptera, Chalcidinae). Bul. Ent. Res., 26:315-22.

Lund, H. O. 1934. Some temperature and humidity relations of two races of *Trichogramma minutum* Riley (Hym. Chalcididae). Ann. Ent. Soc. Amer., 27:324-40.

Schread, J. C. and P. Garman. 1933. Studies on parasites of the Oriental fruit moth. I. *Trichogramma.* Connecticut Agr. Exp. Sta., Bul. 353:687-756.

Schread, J. C. and P. Garman. 1934. Some effects of refrigeration on the biology of *Trichogramma* in artificial breeding. Jour. N. Y. Ent. Soc., 42:263-83.

Van Steenburgh, W. E. 1934. *Trichogramma minutum* Riley as a parasite of the Oriental fruit moth (*Laspeyresia molesta* Busck.) in Ontario. Canad. Jour. Res., 10(3):287-314.

Wigglesworth, V. B. 1939. The principles of insect physiology. 434 p. 316 figs. E. P. Dutton and Company, New York.

OBSERVATIONS ON BRACHYSOMIDA CORPULENTA CSY. (Coleoptera; Cerambycidae)[1]

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Brachysomida corpulenta Csy. was described from a single female from the Levette collection, the type locality given only as California.[2] In the Hopping collection, two females were discovered which agree closely with the original description of *B. corpulenta.* Mr. W. S. Fisher at the U. S. National Museum has kindly compared both specimens with the type in the Casey collection and they agree except in minor detail.

The species is easily recognized by three longitudinal, slightly raised lines on each elytron. These lines are nearly devoid of vestiture and have only a few scattered punctures. The two females before me are dark brown. The type is uniformly brownish-black and the elytra have a slight purplish tinge which seems to be lacking in my specimens. They may not have been fully hardened when they were collected. They were taken by Ralph Hopping at Kaweah, Tulare County, California, over thirty years ago.

[1] Contribution No. 2247, from the Division of Entomology, Science Service, Department of Agriculture, Ottawa.

[2] Casey, Col. T. L., Memoirs on the Coleoptera 4:224, 1913.

Several years before my father died, he received from Dr. E. G. Linsley, a single specimen of *Brachysomida* which is undoubtedly the male of *B. corpulenta*. Since the male apparently has not been known before, the following description is given.

Length 8.5 mm., breadth across humeri 3.3 mm.; entirely black, faintly shining. Head with front very short, about half the length of the clypeus, densely punctate, the punctures not uniform in size; basal two-thirds of clypeus punctate, remainder nearly glabrous; fronto-clypeal suture deeply impressed; coronal suture moderately impressed between the antennae, fading out posteriorly between the eyes; moderately coarsely and densely punctate behind the antennae, the punctures not uniform; antennae stout, about two-thirds the body length, the scape equal in length to the second and third segments combined; the second segment a little broader than long, half the length of the third, basal three or four segments with conspicuous gray hairs; remainder of antennae with short appressed fine pubescence; entire head with long gray hairs. Pronotum with base broader than apex, lateral angles placed before the middle; apex margined rather feebly, strongly margined behind, densely and coarsely punctate, the punctures irregular in size; on the disc a few small areas where punctures are more widely separated, and a glabrous, feebly impressed, rather broad, longitudinal line on basal half, not attaining hind margin. The entire thorax has long, fine gray hairs. Elytra strongly tapered from humeri to apices, each elytron with three broad slightly raised longitudinal lines on which the coarse punctures are scattered; the line nearest the suture reaches back only two-thirds the distance from base to apex, the second and third not quite attaining the apex; spaces between these lines densely and coarsely punctate, the punctures becoming finer toward the apices; silvery vestiture confined mainly to spaces between the raised lines; lateral elytral margins with a well-defined, smooth bead, the sutural bead of each elytron well defined posteriorly, becoming feeble toward the scutellum; elytral apices rounded to suture with a faint suggestion of truncature; ventral surface more finely, moderately sparsely punctate, more densely so on the mesepisternum and finely strigate on the posterior lateral portion of the metasternum; last ventral abdominal segment with posterior margin broadly and evenly rounded with a faint suggestion of a minute notch at middle, but this last may not be a constant character.

The male differs from the female mainly in the much more strongly tapered elytra, the entirely black color, and the more strongly developed raised lines of the elytra.

The specimen was taken by Dr. E. G. Linsley at Lebec, Tejon Pass, Calif.; elevation 4000 feet, May 11, 1928. It has been returned to Dr. Linsley at the University of California, Berkeley.